To Ensure the Integrity of the Cryogenic Propellant Depot Tank Within the Expected Radiation and Space Debris Environment, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

We intend to develop the technology for lightweight composite structure suitable for both cryogenic fuel depot storage as well as human in-space habitat. These will incorporate improved impact technologies for micro-meteor/space debris protection and radiation capable composite technologies. The application of filament wound composite pressure vessels to uses requiring pressurized storage at cryogenic temperatures has been undertaken at HyPerComp Engineering with promising results. Progress has been made in expanding the knowledge of how filament winding fibers and matrix systems (resins) react to loads and strain at extremely cold temperatures, such as would be encountered in in-space fuel storage depots. As with the cryogenic composite pressure vessel research, HyPerComp Engineering has been conducting research and has patented, jointly with NASA, a robust impact resistant composite pressure vessel technology. This technology shows great promise in its resistance to performance degradation from impacts, such as might be experienced in the space environment in the form of micrometeoroids and space debris. This "robust" technology has also demonstrated "non-catastrophic failure-mode" capabilities which could potentially reduce mission losses and tankage losses due to both space debris and other incidental impacts. We intend to develop a baseline composite material capable of both cryogenic and radiation applications.

Anticipated Benefits

Potential commercial applications of the proposed technology would include the commercial satellite industry where they may have hardware in space (i.e. Low Earth Orbit) that is subject to impact and radiation space environmental hazards as well as requiring cryogenic fuel storage for their platforms. Potential NASA applications for the technologies we propose researching and developing would be light weight composite structures that could be used for reliable and safe cryogenic propellant (i.e. fuel depots) storage, radiation resistant/shielding human habitat structures, and robust structures and tankage capable of withstanding micrometeroid and space debris impacts.

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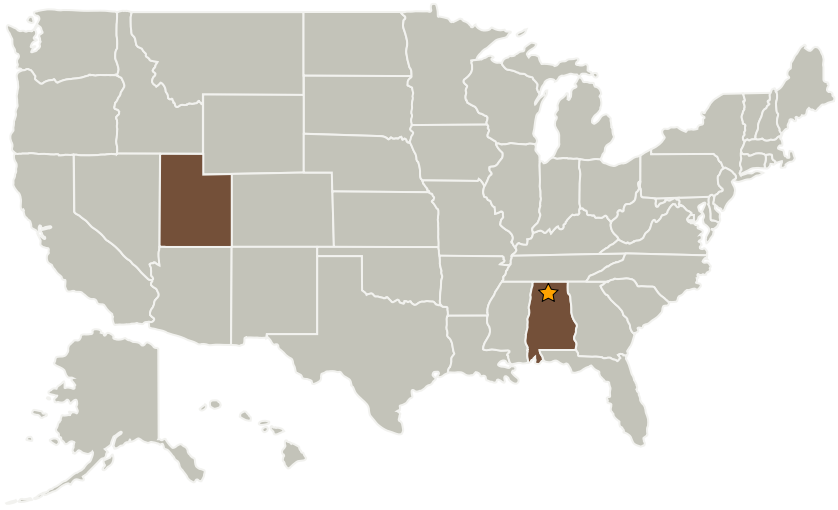
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
HyPerComp Engineering, Inc.	Supporting Organization	Industry	Brigham City, Utah

Primary U.S. Work Locations	
Alabama	Utah

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Thomas L Delay

Principal Investigator:

James P Patterson

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion

Continued on following page.

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Technology Areas *(cont.)*

- TX01.1.1 Integrated Systems and Ancillary Technologies